APPENDIX C

California Department of Fish and Game 2001
Coho Presence Investigation

APPENDIX C1.

Modified Ten Pool Protocol Methodology
DRAFT

California Department of Fish and Game
Northern California - North Coast Region

Modified Ten Pool Protocol
For Use During
Calendar Year 2001 Coho Salmon
Presence/Absence Surveys

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INTRODUCTION

In response to the petition to the California Fish and Game Commission to list coho salmon as an endangered species, pursuant to the California Endangered Species Act (CESA), personnel of the California Department of Fish and Game's (CDFG) Northern California - North Coast Region (NC-NCR) will determine coho salmon presence/absence in a portion of their range in Northern California (Winchuck River system south to the Mattole River system). The objective of this survey is to document coho salmon presence/absence in 396 locations identified in Brown and Moyle's 1994 coho salmon status review in Humboldt, Del Norte, Trinity, Siskiyou, Mendocino and Glenn Counties. This documentation will provide a basis for comparison of the status of coho salmon (in terms of percent presence/absence) reported by Brown and Moyle (1994) with the latest available information. Our approach has two phases: i) file review, and ii) field survey using a modified version of a Ten Pool Protocol reported by Adams et al. (1996).

File Review. CDFG personnel will collect all available current and historic files which describe fish sampling efforts and findings for each of the 396 locations in the project area. The Department of Fish and Game file records will be augmented with data obtained from other sources, including but not limited to, the Forest Science Project (FSP), Humboldt State University, Simpson Timber Company, PALCO and other Scientific Collectors. All documents will be reviewed for date, location, and coho salmon presence. If coho salmon were present, we would attempt to determine their brood year. The result of this effort will be to generate a coho salmon brood year lineage for each stream. Streams with documented coho salmon presence of three consecutive brood years during the period of 1994 through 2000 will not be surveyed in 2001. Streams with missing brood year information will be sampled by any means. If a missing brood year is not established by simpler means, then the ten pool protocol will be employed.

Field Survey. For streams where coho salmon presence/absence data is lacking, or there is no recent survey indicating the presence of coho salmon, the modified ten-pool protocol (described below) will be employed.

Sampling reaches (LOWER MIDDLE, UPPER) will be predetermined before entering the field using the best available data, including, but not limited to previous habitat and biological surveys, stream gradient, channel type, channel entrenchment, topography, size, location of tributary streams and private lands access agreements. GIS will be used to divide the anadromous section of each stream into gradients of 0 to 5%, >5 to <10%, and ≥10%. Stream segments with 0-5% gradient will be given a higher priority for sampling effort. For the purpose of this year's survey, the end of coho salmon anadromy is defined as 0.5 kilometer (0.3 miles) with ≥10% slope and the absence of perennial stream segments with ≤ 5% gradient further upstream.

Snorkel surveys (direct observation) will be the primary sampling technique employed. If project personnel encounter situations where physical habitat features render snorkel surveys ineffective (e.g., high turbidity, deep pools) or if human health hazards (e.g., dairy waste or unknown waste discharges) are present, then alternate sample methods should be employed. Minimum crew sizes for each sampling method are as follows: snorkel survey (2 people); backpack electrofishing (minimum of two people per electrofisher); seining (3 people); and baited minnow trapping (2 people). Snorkeling, electrofishing (a second backpack shocker may be used if the stream is wider than 10 feet) and seining effort will be limited to one pass. Baited minnow trapping effort should be confined to one set (30 minute soak) of at least two traps per pool.

MODIFIED TEN POOL PROTOCOL

A minimum of three reaches will be surveyed in the following sequence: LOWER - MIDDLE - UPPER. Ten pools or flatwater habitat units (hereafter referred to as pools) will be surveyed in any given reach; these ten pools constitute a Survey Section. Field crews will have the latitude to select pools based on shade, velocity and instream habitat complexity, however crews may not skip more than five pools in any given Survey Section.

The pool survey for the lowermost reach will commence where the stream has defined banks and its habitat features are defined by its stream power. This protocol excludes stream segments flowing through aggraded deltas or other areas influenced by high flow of the water to which it is tributary.

Habitats will be sampled as defined by the Level II category for stream habitat typing (riffle, pool, flatwater). The primary Level II habitat types surveyed will be pools; however, if pool habitat is lacking, flatwater habitats (glides, pocket water, run, and step-run) will be sampled. Target streams will be surveyed according to the following decision sequence:

- If coho salmon are present (presence is defined as one coho salmon) in the LOWER Reach Survey Section, then it is not necessary to examine the MIDDLE or UPPER Reaches. Complete all ten pools in the LOWER Reach Survey Section before moving onto the next stream assignment list and repeat this decision sequence.

- If coho salmon are not observed in the LOWER Reach Survey Section, then move up to the MIDDLE Reach Survey Section. If coho salmon are observed in the MIDDLE Reach Survey Section, then it is not necessary to examine the UPPER Reach Survey Section. Move on to the LOWER Reach Survey Section of the next stream on your assignment list and repeat this decision sequence.

- If coho salmon are not observed in the MIDDLE Reach Survey Section, then move up to the UPPER Reach Survey Section. Examine 10 pools and record your findings. Move on to the LOWER Reach Survey Section of the next stream on your assignment list and repeat this decision sequence.

Each surveyed reach shall be flagged at the downstream end and labeled with the following:

II DATE (dd/mm/yyyy)
II DFGCI (acronym for Department of Fish and Game Coho Investigation)
II Stream Reach designation (LOWER, MIDDLE, or UPPER)

Flagging will not be hung within State, National or City Parks, urban areas or anywhere it would be considered a visual nuisance by property owners. These areas are generally high traffic areas, within city limits or close to roads.

The upper and lower boundary of each survey section will be geo-referenced, using GPS, as a waypoint for later downloading into GIS. A Waypoint is entered as a combination of numbers and letters using the unique (Brown and Moyle) designated stream number, followed by a hyphen and A for lower, B for middle or C for the upper survey area. The numerals 1 and 2 are used to define the lower or upper survey area boundary, respectively. For example, the waypoint for the boundary of the lowermost reach of Howe Creek, Eel River is 252-A1. Conversely, the end of the uppermost sample segment of Howe Creek is 252-C2.

The defaults settings for the standard issue GPS 12XL will be the following: Position Format = decimal degrees (hddd.dddd^{o}); Navigation Setup: Map Datum = NAD 27 CONUS, CDI = $\underline{+}$0.25, Angle = Degrees, Units = Statute, Heading = E016; System Setup, Offset -7.00, Hours =24. GPS units will be checked prior to each days field surveys for the above settings due to the possibility of the units resetting to factory defaults when the batteries run low.

Snorkel surveyors will travel through each Survey Section in an upstream direction. Enter each pool at the downstream end, in a manner which will minimize fish disturbance, and move upstream. Record fish and other vertebrate species observed; assign an abundance category (e.g., 0 = no fish, 1 = 1 fish; 2 = 2-5 fish; 3 = > 5 fish) for each fish species present. Salmon (e.g., chinook and coho) will be identified by species. Steelhead and coastal cutthroat trout are difficult to identify at a small size, so lump them together and record your abundance rating in the “Trout” column on the data card. Separate coastal cutthroat trout from steelhead only if you can make a positive identification.

If a crew encounters a section where stream gradient exceeds 10% which was not modeled by GIS or any other barriers, the crew will determine if continuing the survey is warranted. If coho salmon passage is not possible, then survey the ten pools immediately downstream of the barrier and fully document the decision-making process through narrative and photographs. The base of the barrier should be recorded in the field notes and entered in the GPS as a waypoint. If coho salmon passage is possible, then proceed to the next reach assignment, but note and photograph this area for future reference.

While conducting your survey, it may be necessary to check a pool a second time because one or both members are not confident in their results. In this case, wait at least 20 minutes to let the fish settle down and for the pool to clear, then repeat the dive. If the team members agree that confidence is again low, flag the pool and enter its coordinates as a waypoint in the GPS, and move upstream to the next pool. Be sure not to count the problem pool as part of the ten pools. If the confidence level is high, then only record results of the second dive. In either case, clearly describe your decision-making process on the data sheet.

Record the description of each surveyed pool to Level IV Habitat Type category, if possible. Visually estimate average wetted width, average length, and maximum depth for all surveyed pools. In the case of a skipped pool (see preceding paragraph), identify its Level IV designation and visually estimate the dimensions of the pool.

Photographs. Take at least one photograph of each pool surveyed. The photograph(s) should frame the entire pool and all its significant features. Photographs should include a placard (Mylar or plastic slate) with the stream name, location, reach, and pool number. The placard with the stream name should be located in the shade to keep the lettering from washing out in the picture. Photographs of fish barriers, water diversion, sources of pollution, and examples of excellent habitat conditions should also have a placard with stream name in view. Using a fine point Sharpe, label all used rolls of film and their canisters with the date, stream name and reach. Write the same information on a separate piece (two to three inches) of flagging and also place it inside the film cannister. (Note: do not change film where a dropped roll could be lost. For example, do not sit on a rock in mid-stream and change rolls as a dropped roll of film can be swept away.)

If you use sampling methods that will give you “fish-in-hand” (e.g., electrofishing, baited minnow trapping, etc., photograph at least one coho salmon for documentation, when they are found.

At the end of each stream survey and before leaving the area, spend several minutes writing a narrative about special stream features, especially the reason for deviating from the established protocol. A journal will be included in each sample kit for this purpose.

Snorkel Survey Training

Snorkel surveyors will have a minimum of 8 dive hours in waters bearing coho salmon, chinook salmon and steelhead. Snorkel divers will be taught and practice standardized counting techniques, fish identification, and habitat type recognition. These training hours are to be supervised by a Department fisheries biologist or other trained and qualified equivalent individuals with at least three field seasons of snorkeling experience for juvenile salmonids. Records of training hours will be maintained. Snorkel surveyors will only be deployed in the field if they are capable of identifying coho salmon, chinook salmon and steelhead with no errors.

Backpack electrofishing crews will be lead by project-members who have had at least one field season of electrofishing experience. To become an electroshocking crew leader, a crew member must have at least 160 hours of supervised hands-on experience and the confidence of their lead and co-workers. This training will include familiarization with electrofisher set-up, setting controls, electrofishing techniques, fish anesthesia, fish identification and handling. Techniques to minimize the risk of fish injury and mortality will be stressed.

Each project-member will gain at least 4 hours of supervised hands-on training by an experienced Department fisheries biologist in the use of baited minnow traps and it's application in fish surveys. This training will include identifying trap locations, trap rigging and baiting, deployment, trap recovery, fish removal and handling.

All divers will be given water safety training (including swiftwater rescue technician [or equivalent] training, first aid, CPR, and other tailgate safety briefings, as appropriate.

Quality Assurance/Quality Control

Up to 5% of all streams will be selected for a re-visit by a second snorkel survey team for the purpose of Quality Assurance/Quality Control (QA/QC). The dive team conducting the QA/QC will: i) not have access to the survey data to avoid bias, ii) will employ the one pass method, and iii) conduct the dive during the same work week the first dive occurred.

If the species list resulting from the QA/QC survey varies from the list of species observed in the first survey, the first team is placed under probation. Crew members under probation will be paired up with a biologist; probation will be lifted once the biologist's confidence is regained.

Because photographs will record species composition, QA/QC will not be required for minnow trapping and electrofishing surveys.

Each data omission on the field form, without explanation, and changes of protocol without explanation constitute a QA/QC error. Five data entry irregularities per stream reach will constitute data QA/QC failure and will require data audits of the next five stream surveys.

LITERATURE CITED

Adams, P.B., T.E. Laidig, K.R. Silverberg, M.J. Bowers, B.M. Jarvis, K.M. Sakuma, K. Baltz, and D. Woodbury. 1996. Historical and Current Presence-Absence Data of Coho Salmon (*Oncorhynchus kisutch*) in the Central California Evolutionary Significant Unit. U.S. National Marine Fisheries Service. Southwest Science Center Administrative Report T-96-01. 24 p.

Adams, P.B., M.J. Bowers, H. Fish, T.E. Laidig, and K.R. Silverberg. 1999. Historical and Current Presence-Absence of Coho Salmon (*Oncorhynchus kisutch*) in the Central California Coast Evolutionarily Significant Unit. U.S. National Marine Fisheries Service. Southwest Science Center Administrative Report SC-99-02. 24 p.

Brown, L.R., P.B. Moyle, and R.M. Yoshiyama. 1994. Historical Decline and Current Status of Coho Salmon in California. North American Journal of Fisheries Management 14:237-261.

Brownell, N.F., W.M. Kier, and M.L. Reber. 1999. Historical and Current Presence and Absence of Coho Salmon, *Oncorhynchus kisutch,* in the Northern California Portion of the

Southern Oregon-Northern California Evolutionary Significant Unit. Report prepared for the U.S. National Marine Fisheries Service, Southwest Fisheries Science Center. Kier and Associates, Sausalito, California. 49 p.

APPENDIX C2

List of Streams Surveyed

Southern Oregon/Northern California Coast ESU

Stream	Basin	Coho Presence	Stream	Basin	Coho Presence	Stream	Basin	Coho Presence
South Fork Winchuck River	Winchuck River	yes	Klamth River (estuary)	Klamath River	yes	Lower South Fork Little River	Little River	yes
Broken Kettle Creek (S. Fork)	Illinois River	yes	Hunter Creek	Klamath River	yes	Upper South Fork Little River	Little River	yes
Elk Creek	Illinois River	yes	Terwer Creek	Klamath River	yes	Strawberry Creek	Coastal	no
Dunn Creek	Illinois River	yes	McGarvey Creek	Klamath River	yes	Mad River	Mad River	yes
Smith River	Smith River	yes	Blue Creek	Klamath River	yes	Warren Creek	Mad River	yes
Rowdy Creek	Smith River	yes	Nickowitz Creek	Klamath River	no	Lindsay Creek	Mad River	yes
Dominie Creek	Smith River	yes	Ah Pah Creek	Klamath River	yes	Grassy Creek	Mad River	no
Savoy Creek	Smith River	yes	Trinity River	Klamath River	yes	Squaw Creek	Mad River	yes
Copper Creek	Smith River	yes	Campbell Creek	Klamath River	yes	Mather Creek	Mad River	yes
Morrison Creek	Smith River	no	Horse Linto Creek	Klamath River	yes	Hall Creek	Mad River	yes
Jaqua Creek (Little Mill Creek)	Smith River	yes	Willow Creek	Klamath River	yes	Noisy Creek	Mad River	yes
Mill Creek	Smith River	yes	S. Fk Trinity River	Klamath River	yes	Mill Creek	Mad River	no
E Fork Mill Creek	Smith River	yes	N. Russian Creek	Klamath River	no	Leggit Creek	Mad River	no
Bummer Lake Creek	Smith River	yes	Knownothing Creek	Klamath River	yes	Kelly Creek	Mad River	no
West Branch Mill Creek	Smith River	yes	Tompkins Creek	Klamath River	no	Powers Creek	Mad River	no
South Fork Smith River	Smith River	yes	Kelsey Creek	Klamath River	no	Palmer Creek	Mad River	no
Craigs Creek	Smith River	no	Mill Creek	Klamath River	yes	Quarry Creek	Mad River	no
Coon Creek	Smith River	no	Patterson Ck	Klamath River	no	N Fk Mad River	Mad River	yes
Hurdygurdy Creek	Smith River	no	Etna Creek	Klamath River	no	Sullivan Gulch	Mad River	yes
Jones Creek	Smith River	no				Dry Creek	Mad River	no
Muzzleloader Creek	Smith River	no	French Creek	Klamath River	yes	Canon Creek	Mad River	yes
Buck Creek	Smith River	no	Miners Creek	Klamath River	yes	Maple Creek	Mad River	yes
Quartz Creek	Smith River	no	Sugar Creek	Klamath River	no	Black Creek	Mad River	no
Eightmile Creek	Smith River	yes	Big Mill Creek	Klamath River	no	Boulder Creek	Mad River	yes
Williams Creek	Smith River	no	Shasta River	Klamath	yes	Janes Creek	Humboldt Bay	no
Myrtle Creek	Smith River	no	Bogus Creek	Klamath River	yes	Jolly Giant Creek	Humboldt Bay	no
Hardscrabble Ck.	Smith River	no	Redwood Creek	Redwood Creek	yes	Jacoby Creek (Morrison Gulch)	Humboldt Bay	yes
Still Creek	Smith River	no	Prairie Creek	Redwood Creek	yes	Rocky Gulch	Humboldt Bay	no
Diamond Creek	Smith River	no	Little Lost Man Creek	Redwood Creek	yes	Cochran Creek	Humboldt Bay	no
			Lost Man Creek	Redwood Creek	yes	Freshwater Ck	Humboldt Bay	yes
Eighteenmile Creek	Smith River	no	Streelow Creek	Redwood Creek	yes	McCready Creek	Humboldt Bay	yes
Patrick Creek	Smith River	yes	May Creek	Redwood Creek	yes	Little Freshwater	Humboldt Bay	yes
Twelvemile Ck	Smith River	no	Godwood Creek	Redwood Creek	yes	Cloney Creek	Humboldt Bay	yes
Elevenmile Creek	Smith River	no	Boyes Creek	Redwood Creek	yes	Falls Gulch	Humboldt Bay	yes
Shelly Creek	Smith River	no	Brown Creek	Redwood Creek	yes	Graham Gulch	Humboldt Bay	yes
Tenmile Creek	Smith River	no	Tom McDonald Ck	Redwood Creek	yes	Ryan Creek	Humboldt Bay	yes
West Fork Patrick Creek	Smith River	no	Bridge Creek	Redwood Creek	yes	North Fork Elk River	Humboldt Bay	yes
Monkey Creek	Smith River	no	Coyote Creek	Redwood Creek	no	Martin Creek	Humboldt Bay	yes
Siskiyou Fork	Smith River	no	Panther Creek	Redwood Creek	no	South Fork Elk River	Humboldt Bay	yes
Packsaddle Ck	Smith River	no	Lacks Creek	Redwood Creek	no	Little South Fork Elk River	Humboldt Bay	yes
Griffin Creek	Smith River	no	McDonald Creek	Stone Lagoon	no	College of Redwoods Ck	Humboldt Bay	no
Knopti Creek	Smith River	yes	Fresh Creek	Stone Lagoon	no	Salmon Creek	Humboldt Bay	no
Yonkers Creek	Coastal	no	Big Lagoon	Big Lagoon	no			
Jordan Creek	Coastal	no	Little River	Little River	yes			
Elk Creek	Coastal	yes	South Fork Little River (Carson Ck)	Little River	yes			
Wilson Creek	Coastal	yes						
Eel River estuary	Eel River	yes	Bear Pen Creek	Eel River	yes	McNutt Gulch	Coastal	no
Salt River	Eel River	no	Cub Creek	Eel River	no	Mattole River	Mattole River	yes
Russ Creek	Eel River	no	Red Mountain Creek	Eel River	no	North Fork Mattole River	Mattole River	no
Reas Creek	Eel River	no	Wildcat Creek	Eel River	no	Mill Creek	Mattole River	no
Palmer Creek	Eel River	no	Hollow Tree Creek	Eel River	yes	Clear Creek	Mattole River	no

Stream	Basin	Coho Presence	Stream	Basin	Coho Presence	Stream	Basin	Coho Presence
Rohner Creek	Eel River	no	Mule Creek	Eel River	no	McGinnis Creek	Mattole River	no
Van Duzen River	Eel River	no	Walters Creek	Eel River	no	Indian Creek	Mattole River	no
Wolverton Gulch	Eel River	no	Redwood Creek	Eel River	yes	Squaw Creek	Mattole River	no
Yager Creek	Eel River	no	Bond Creek	Eel River	yes	Granny Creek	Mattole River	no
Wilson Creek	Eel River	no	Michaels Creek	Eel River	yes	Saunders Creek	Mattole River	no
Cooper Mill Creek	Eel River	no	Waldron Creek	Eel River	no	Woods Creek	Mattole River	yes
Lawrence Creek	Eel River	no	Huckleberry Creek	Eel River	yes	Upper N. Fork Mattole River	Mattole River	no
Shaw Creek	Eel River	no	Butler Creek	Eel River	yes	Oil Creek	Mattole River	no
Cuddeback Creek	Eel River	no	Cedar Creek	Eel River	no	Honeydew Creek	Mattole River	yes
Fiedler Creek	Eel River	no	Rattlesnake Creek	Eel River	no	Bear Trap Creek	Mattole River	no
Cummings Creek	Eel River	no	Cummings Creek	Eel River	no	Dry Creek	Mattole River	no
Hely Creek	Eel River	no	Tenmile Creek	Eel River	yes	Middle Creek	Mattole River	no
Root Creek	Eel River	no	Grub Creek	Eel River	no	Gilham Creek	Mattole River	no
Grizzly Creek	Eel River	no	Streeter Creek	Eel River	no	Fourmile Creek	Mattole River	yes
Stevens Creek	Eel River	no	Big Rock Creek	Eel River	no	Sholes Creek	Mattole River	yes
Hoagland Creek	Eel River	no	Mill Creek	Eel River	no	Harrow Creek	Mattole River	no
Little larabee Creek	Eel River	no	Cahto Creek	Eel River	no	Grindstone Creek	Mattole River	yes
Price Creek	Eel River	no	Fox Creek	Eel River	no	Mattole Canyon	Mattole River	no
Howe Creek	Eel River	no	Elder Creek	Eel River	no	Blue Slide Creek	Mattole River	no
Atwell Creek	Eel River	no	Jack of Hearts Creek	Eel River	yes	Bear Creek	Mattole River	no
Dinner Creek	Eel River	no	Little Charlie Creek	Eel River	no	South Fork Bear Creek	Mattole River	no
Jordan Creek	Eel River	no	Dutch Charlie Creek	Eel River	yes	Bridge Creek	Mattole River	no
Shively Creek	Eel River	no	Redwood Creek	Eel River	yes	McKee Creek	Mattole River	no
Bear Creek	Eel River	no	Rock Creek	Eel River	no	Vanauken Creek	Mattole River	no
Chadd Creek	Eel River	no	Kenny Creek	Eel River	yes	Mill Creek	Mattole River	yes
Larabee Creek	Eel River	no	Haun Creek	Eel River	no	Baker Creek	Mattole River	yes
Carson Creek	Eel River	no	Taylor Creek	Eel River	yes	Thompson Ck	Mattole River	yes
South Fork Eel River	Eel River	yes	Bear Creek	Eel River	no			
Bull Creek	Eel River	yes	Newman Creek	Eel River	no			
Squaw Creek	Eel River	no	Kekawaka Creek	Eel River	no			
Albee Creek	Eel River	no	Bluff Creek	Eel River	no			
Mill Creek	Eel River	no	Middle Fork Eel River	Eel River	no			
Canoe Creek	Eel River	yes	Mill Creek	Eel River	no			
Bridge Creek	Eel River	no	Grist Creek	Eel River	no			
Elk Creek	Eel River	no	Rattlesnake Creek	Eel River	no			
Salmon Creek	Eel River	yes	Rock Creek	Eel River	no			
Butte Creek	Eel River	no	Outlet Creek	Eel River	no			
Fish Creek	Eel River	no	Bloody Run Creek	Eel River	no			
Anderson Creek	Eel River	no	Long Valley Creek	Eel River	no			
Dean Creek	Eel River	no	Reeves Canyon Creek	Eel River	no			
Redwood Creek	Eel River	yes	Rowes Creek	Eel River	no			
Seely Creek	Eel River	yes	Ryan Creek	Eel River	no			
Miller Creek	Eel River	no	Mill Creek	Eel River	yes			
China Creek	Eel River	yes	Willits Creek	Eel River	yes			
Dinner Creek	Eel River	yes	Dutch Henry Creek	Eel River	no			
Sproul Creek	Eel River	yes	Broaddus Creek	Eel River	yes			
Warden Creek	Eel River	no	Baechtel Creek	Eel River	yes			
West Fork Sproul Creek	Eel River	yes	Haehl Creek	Eel River	no			
East Branch South Fork Eel River	Eel River	no	Rocktree Creek	Eel River	no			
Durphy Creek	Eel River	no	String Creek	Eel River	no			
Milk Ranch Creek	Eel River	no	Tartar Creek	Eel River	no			
Low Gap Creek	Eel River	no	Bear River	Bear River	no			
Indian Creek	Eel River	yes	Bonanza Gulch	Bear River	no			
Piercy Creek	Eel River	yes	South Fork Bear River	Bear River	no			
Standley Creek	Eel River	yes	Hollister Creek	Bear River	no			
McCoy Creek	Eel River	yes						

Central California Coast ESU

Stream	Basin	Coho Presence		Stream	Basin	Coho Presence
Whale Gulch Creek	Coastal	no		Doyle Creek	Coastal	yes
Jackass Creek (Wolf)	Coastal	no		Little Salmon Cr.	Big Salmon Creek	yes
Russian Gulch	Coastal	no		Flynn Creek	Navarro River	yes
Mill Creek	Navarro River	no		Mark West Creek	Russian River	yes
Indian Creek	Navarro River	no		Cottoneva Creek	Coastal	yes
Gut Creek	Navarro River	no		SF Cottoneva Creek	Cottoneva Creek	yes
Rancheria Creek	Navarro River	no		Ten Mile River	Coastal	yes
Ham Canyon Creek	Navarro River	no		NF Ten Mile River	Ten Mile River	yes
Horse Creek	Navarro River	no		Little NF Ten Mile	Ten Mile River	yes
Brush Creek	Coastal	no		SF Ten Mile River	Ten Mile River	yes
Fish Rock Gulch	Coastal	no		Smith Creek	Ten Mile River	yes
Gualala	Coastal	no		Campbell Creek	Ten Mile River	yes
NF Gualala River	Gualala River	no		Churchman's Creek	Ten Mile River	yes
Doty Creek	Gualala River	no		MF Ten Mile River	Ten Mile River	yes
SF Gualala River	Gualala River	no		Bear Haven Creek	Ten Mile River	yes
Franchini Creek	Gualala River	no		Little Valley Creek	Pudding Creek	yes
Marshall Creek	Gualala River	no		Little NF Noyo R.	Noyo River	yes
Wheatfield Fork	Gualala River	no		Duffy Gulch	Noyo River	yes
Haupt Creek	Gualala River	no		NF Noyo River	Noyo River	yes
House Creek	Gualala River	no		Marble Gulch	Noyo River	yes
Fort Ross Creek	Coastal	no		Haysworth Creek	Noyo River	yes
Russian Gulch	Coastal	no		Olds Creek	Noyo River	yes
Middle Branch	Russian Gulch	no		Redwood Creek	Noyo River	yes
East Branch	Russian Gulch	no		Big River	Coastal	yes
Willow Creek	Russian River	no		NF Big River	Big River	yes
Sheephouse Creek	Russian River	no		EB NF Big River	Big River	yes
Freezeout Creek	Russian River	no		Albion River	Coastal	yes
Austin Creek	Russian River	no		SF Albion River	Albion River	yes
Kidd Creek	Russian River	no		Railroad Gulch	Albion River	yes
Ward Creek	Russian River	no		NF Albion River	Albion River	yes
East Austin Creek	Russian River	no		Big Salmon Creek	Coastal	yes
Gilliam Creek	Russian River	no		Hazel Gulch	Big Salmon Creek	yes
Gray Creek	Russian River	no		Navarro River	Coastal	yes
Dutch Bill Creek	Russian River	no		SB NF Navarro R	Navarro River	yes
Hulbert Creek	Russian River	no		NB NF Navarro R	Navarro River	yes
Dry Creek	Russian River	no		Little NF Navarro	Navarro River	yes
Mill Creek	Russian River	no		John Smith Creek	Navarro River	yes
Wallace Creek	Russian River	no		Lagunitas Creek	Lagunitas Creek	yes
Pena Creek	Russian River	no		Olema Creek	Lagunitas Creek	yes
EF Russian River	Russian River	no		Devil's Gulch Cr.	Lagunitas Creek	yes
WF Russian River	Russian River	no		San Geronimo Cr.	Lagunitas Creek	yes
York Creek	Russian River	no		Pine Gulch Creek	Bolinas Lagoon	yes
Forsythe Creek	Russian River	no		Redwood Creek	Coastal	yes
Mill Creek	Russian River	no		Walker Creek	Tomales Bay	
Seward Creek	Russian River	no		Salmon Creek	Walker Creek	
Eldridge Creek	Russian River	no		SF Gualala River	Gualala River	
Jack Smith Creek	Russian River	no		Usal Creek	Coastal	
Salt Hollow Creek	Russian River	no		NF Cottoneva Creek	Cottoneva Creek	
Rocky Creek	Russian River	no		Hardy Creek	Coastal	
Mariposa	Russian River	no		Juan Creek	Coastal	
Fisher	Russian River	no		Little Juan Creek	Juan Creek	
Corral	Russian River	no		Mill Creek	Ten Mile River	
Scotty Creek	Coastal	no		Redwood Creek	Ten Mile River	
Salmon Creek	Coastal	no		MF NF Noyo River	Noyo River	
Finley Creek	Salmon Creek	no		Tramway Gulch	Big River	
Coleman Creek	Salmon Creek	no		SF Big River	Big River	
Fay Creek	Salmon Creek	no		Ramon Creek	Big River	
Tannery Creek	Salmon Creek	no		Daugherty Creek	Big River	

Stream	Basin	Coho Presence		Stream	Basin	Coho Presence
Johnson Creek	Big River	no				
Buckhorn Creek	Coastal	no				
Bridge Creek	Navarro River	no				
NF Indian Creek	Navarro River	no				
Greenwood Creek	Coastal	no				
Mallo Pass Creek	Coastal	no				
Elk Creek	Coastal	no				
Three Springs Cr.	Elk Creek	no				
Soda Fork	Elk Creek	no				
Sulphur Fork	Elk Creek	no				
Garcia River	Coastal	no				
Schooner Gulch	Coastal	no				
NF Schooner Gulch	Schooner Gulch	no				
Fuller Creek	Gualala River	no				
Nicasio Creek	Lagunitas Creek	no				

APPENDIX D.

HISTORICAL OCCURRENCE OF COHO SALMON IN THE UPPER KLAMATH, SHASTA, AND SCOTT RIVERS.

California Department of Fish and Game
Northern California and North Coast Region
February 2002

There has been recent public controversy regarding the historical distribution of coho (or silver) salmon (*Oncorhynchus kisutch*) in California. Some believe that coho salmon are not native to the upper Klamath River and tributaries (Siskiyou County Farm Bureau 2001a, 2001b; Interactive Citizens United 2001; California Farm Bureau Federation 2001). Others contend that coho salmon are not native to California (Greenhorn Action Grange 2001). Reasons cited are that existing natural coho salmon populations in the upper Klamath River and tributaries (primarily the Scott and Shasta rivers) are derived from hatchery stocking of non-indigenous stocks in the late nineteenth century (Siskiyou County Farm Bureau 2001a, 2001b; Interactive Citizens United 2001; California Farm Bureau Federation 2001) and natural historical habitat conditions did not provide suitable habitat conditions to support self-sustaining coho salmon populations (Siskiyou County Farm Bureau 2001a; Greenhorn Action Grange 2001). The purpose of this report is to review the available information and to provide some insight on whether coho salmon are native to the upper Klamath River and tributaries.

Written documentation regarding coho salmon in the Klamath Basin, especially in the upper Klamath River, is scarce prior to the early 1900's. Contributing to the lack of information was the apparent difficulty in recognizing that there were different species of salmon inhabiting the rivers of the state. Fortune et al. (1966), reviewed Klamath Falls newspaper accounts of salmon and possibly steelhead in the upper Klamath Basin and found that many people had difficulty properly identifying the different species of salmonids in the river. The term "salmon-trout" was a popular name used by many local inhabitants to describe any large, silvery-looking fish that appeared periodically in the river. Fortune et al. (1966) suggests that Klamath River fishermen apparently supported the use of the term salmon-trout *"in order to fish when trout season was closed, as there was no closed season on salmon-trout*". On April 9, 1912, The Evening Herald published an article that classified all trout on the Pacific Coast as "salmon-trout".

Snyder (1931) stated that *"(s)ilver salmon are said to migrate to the headwaters of the Klamath to spawn. Nothing definite was learned about them from inquiry because most people are unable to distinguish them*". It was his opinion that there was little interest in coho salmon in general because chinook salmon were so much larger and more abundant. The lack of ability to differentiate between various salmonid species was not only a problem in the Klamath Basin, but apparently occurred throughout the State. In the Twenty-Second Biennial Report to the State of California Fish and Game Commission (CFGC 1913) , W. H. Shebley, Superintendent of Hatcheries, writes *"Strange as it may appear, the presence of the silver [coho] salmon in the waters of this State remained unnoticed until Dr. Gilbert, Professor of Zoology at Stanford University, a few seasons ago called attention to them. Heretofore, all the salmon taken in our rivers have been commercially classed as Quinnat [chinook]"*.

Early Stocking History

The earliest record of coho salmon being stocked in the Klamath Basin was of a plant made in 1895. Fortune et al. (1966) reports that 460,000 coho salmon were stocked in the Klamath River (300,000 fry and 160,000 yearlings). Further examination of the original records from the U.S. Commission on Fish and Fisheries (1895) revealed those fish were raised in the Ft. Gaston facility in Hoopa and were stocked in the Trinity River and in Supply Creek, a tributary to the Trinity River. Those fish were reared from eggs taken at a facility in Redwood Creek (a substation of the Ft. Gaston facility) and also from eggs shipped from another facility not identified in the report (but were likely from out of the basin). Insight as to the purpose of this 1895 coho salmon plant may be found in the U.S. Commission on Fish and Fisheries (1895) report that states; "*Most of the salmon and steelhead eggs were taken at the* [Redwood Creek] *substation, as there was no run of either kind in the Trinity, all the fish having been taken at the cannery at the mouth of Klamath River*". Although the Ft. Gaston facility operated until 1898, 1895 was the only year coho salmon were stocked into the Klamath Basin prior to 1911 (Cobb 1931).

In anticipation of the construction of Copco Dam, the "Klamathon Racks", a fish egg taking station located near the old town of Klamathon, was built in 1910 and began operating that same year (Leitritz 1970). These racks extended across the Klamath River, effectively blocking the salmon runs. The Klamathon Racks were, "*necessary that the supply of salmon may be maintained in the Klamath River...*" (CFGC 1918). Fish trapping records beginning in the 1910-1911 season indicate that coho salmon were migrating upriver through that area, making it clear that their upstream migration encompassed areas upriver from where the Iron Gate and Copco dams now reside (Cobb 1931).

Although the construction of the Klamathon Racks began in 1910, the racks were not completed on time. The Fiscal Year 1911 report (July 1, 1910 to June 30, 1911) of the U.S. Fish Commissioner states that: *"....the racks were not completed in time to intercept the run of chinook salmon. Later in the season, before the completion of the silver salmon work, they were carried away, but not before satisfactory collections of eggs had been made"*. The actual number of coho salmon eggs taken during the 1910-1911 season at the Klamathon Racks was not given in the records, however, 2,109,000 coho salmon eggs collected there were transferred to the California Fish Commission's Sisson (Mt. Shasta) Hatchery (CFGC 1913). The resultant fry were subsequently stocked back into the Klamath and Sacramento rivers (CFGC 1913). This was the first effort made by the State of California to increase the runs of coho salmon (CFGC 1913). Beginning with the 1912-1913 season, coho salmon eggs taken at the Klamathon Racks were mostly reared and released from the US Bureau of Fisheries' Hornbrook Hatchery on the Klamath River.

Apparently, no coho salmon eggs were collected at the Klamathon Racks during the 1911-1912 and 1917-1918 seasons as coho salmon are not mentioned in the available federal and state records. However, coho salmon eggs were taken during the five consecutive seasons beginning with the 1912-1913 season (Cobb 1931). With two exceptions (1913-1914 and 1915-1916), the numbers of coho salmon eggs collected each season at the Klamathon Racks are not available, however, the number of fry reared at the Hornbrook Hatchery from coho salmon eggs taken at the Klamathon Racks are provided (Cobb 1931, Fortune et al. 1966). Number of eggs collected and number of coho salmon produced from 1910 through 1917 are summarized in Appendix Table D-1.

Appendix Table D-1. Coho salmon eggs collected at the Klamathon Racks and coho salmon hatchery production in the upper Klamath River, 1910 through 1917 (source: CFGC 1913; Cobb 1931; Fortune 1966).

Season	Eggs taken	Number of coho produced	Est. # of females[2/]	Number released to Klamath River[1/]		
				Fry	Yearling	Total
1910-1911	2,109,000 (minimum)	unknown	881	700,000	0	700,000 [3/]
1911-1912	0	0	0	0	0	0
1912-1913	unknown	117,320	49	17,320	0	17,320[4/]
1913-1914	3,129,000	2,632,300	1,307	2,548,960	0	2,548,960
1914-1915	unknown	2,375,770	992	1,098,000	0	1,098,000[5/]
1915-1916	2,823,000	2,169,050	1,179	2,169,050	0	2,169,050
1916-1917	unknown	61,000	25	50,000	11,000	61,000

1/ Released in Siskiyou County.
2/ Number of coho produced, or eggs taken if available, divided by 2,394 (average # of eggs per female coho).
3/ 719,000 were also stocked in the Sacramento River.
4/ Disposition of 100,000 remaining eggs collected is not specified in the available records.
5/ Disposition of remaining coho production is not given in the available records.

To estimate the number of females needed to obtain the number of eggs collected at the Klamathon Racks, we used the average number of eggs per female coho salmon (2,394 - see Coho Salmon Status Review, *Chapter III, Biology - Life History and Unique Characteristics*). Based on this, an estimated 881 females would have been required to obtain the number of eggs collected at the Klamathon Racks that were transferred to Sisson Hatchery during the 1910-1911 season. Greater numbers of females were required in subsequent seasons (1913-1914 through 1915-1916) (Appendix Table D-1). The 1912 -1913 and 1916-1917 seasons were drought years in which the take of salmon eggs, both chinook and coho salmon, was greatly reduced (Fiscal Year 1913 report of the U.S. Fish Commissioner, CFGC 1918). The relatively large numbers of coho salmon females required to yield the reported egg take and hatchery production indicates that significant numbers of coho salmon were in the Klamath River in the vicinity of the Klamathon Racks during those years.

The Klamathon Racks were rebuilt during the fall of 1918 and ownership of the facility was granted to the State of California by the U.S. Bureau of Fisheries. It began supplying most of the eggs utilized by the State because production from other stations, such as the Baird Station on the McCloud River, was seriously curtailed due to impacts from ocean harvest, irrigation diversions and dam building (CFGC 1921). At this time, fish culture emphasis for the State focused on the production of chinook salmon and trout, and although many coho salmon were caught at the Klamathon Racks, it was the larger chinook salmon that were selected (Bryant 1923). Since the Hornbrook Hatchery was considered by the State to be ill-equipped to rear fry and because it had an unreliable water supply, the facility was abandoned in 1919 in favor of the new Fall Creek Hatchery (CFGC 1921).

Fortune et al. (1966) indicates that hatchery coho salmon were stocked in the Klamath River on only four occasions between 1919 and 1959. Totals of 178,000, 73,380, 20,000 and 20,000 fry and fingerlings were planted in 1919, 1934, 1940 and 1941, respectively. A review of California Fish and Game Commission Biennial Reports for the years 1930 through 1950 reveals that additional plants totaling 476,000 coho salmon were made to the Klamath River (Siskiyou County) between 1930 and 1932 (CFGC 1932). These fish were reared at the Fall Creek Hatchery (CFGC 1932) and presumably originated from the Klamathon Racks, as was the practice of the day.

Hatchery Stocks

Historically, the practice of importing non-native fish was common, especially in systems where native fish had been extirpated or were in low abundance (also see Status Review, *Chapter VII*, *Influence of Existing Management Efforts*). Following completion of Iron Gate Hatchery in 1966, adult coho salmon returns were less than 500 fish. After the completion of Trinity River Hatchery in 1963, adult coho salmon returns at this facility rarely exceeded 1,000 fish prior to 1971. In an effort to increase returns to Iron Gate Hatchery, coho salmon from the Cascade River in Oregon were stocked in 1966, 1967 and 1969 (CDFG 1994). The first significant transfer of coho salmon to Trinity River Hatchery occurred in 1964 when Eel River coho salmon stock were brought in. This was followed by plantings of coho salmon originating from the Cascade River, Oregon in 1966, 1967 and 1969. Noyo River stock was also planted in 1969 and Alsea River stock was planted in the Trinity in 1970 (CDFG 1994). It appears the intent of these out-of-basin transfers was to augment already existing, albeit dwindling, natural coho salmon populations. Current California Fish and Game Commission policy now essentially prohibits all out-of-basin fish transfers.

Coho Salmon in the Shasta and Scott Rivers

In 1930, the California Department of Fish and Game (Department) installed and began operating a fish counting station in the Shasta River near its confluence with the Klamath River. This counting station has been operated annually since then to enumerate the return of fall-run chinook salmon. In a few years however, the counting station has been operated later into the season to count coho salmon and steelhead. Coho salmon returns to the Shasta River have been documented in almost every year since 1934. More than 291 coho salmon were counted in 2001 (Mark Hampton, pers. comm.). Similar information is lacking for the Scott River as few attempts were made to document coho salmon returns in the past. However, the Department estimated historical coho salmon escapement in the Scott River to be 2,000 fish (CDWR 1965). The basis for this estimate is not provided in the report and thus the accuracy of the estimate cannot be determined. Brownell et. al. (1999) reviewed Department warden diaries from the 1950s that showed *"coho salmon in virtually every upper Klamath and Scott stream with a ditch and hayfield"*. Prior to a federally-funded channel improvement project through the Scott River Valley, the Scott River was a low velocity, meandering stream, which is ideal for coho salmon (Brownell et. al. 1999).

In the Scott River basin, adults are known to spawn in the East Fork of the Scott River upstream to Meadow Creek and in the South Fork as far as Jackson Creek. Coho salmon spawning was recently confirmed (Dec. 14, 2001) in the East Fork of the Scott River to approximately 200 yards upstream of the mouth of Kangaroo Creek, beneath the Highway 3 bridge crossings on Sugar and French creeks, and in Miners Creek immediately downstream of the lower Miners Creek Road bridge crossing. Coho salmon also utilize many other tributaries to the Scott River such as Kelsey, Tompkins, Shackelford, Mill, Kidder, Patterson, and Etna creeks (Hassler et al. 1991). Juvenile coho salmon have been recently captured in Scott River mainstem outmigrant trapping efforts (Chesney 2002).

The distribution of rearing coho salmon within the streams listed above appear to be largely confined to the relatively deeper pool (>1.5') habitat where small and large woody debris (e.g. tree branches, tree trunks, root wads or overhanging live woody-stemmed vegetation) exist. These tributary streams also have a relatively dense riparian canopy which shades the stream for much of the day, keeping stream temperatures generally below 68^{o}F throughout the summer months, thus providing marginally suitable rearing habitat conditions for juvenile coho salmon.

Juvenile coho salmon are generally found where stream gradients are less than 3 to 4 percent. A good woody debris complex within deeper pool habitats appears to override bottom substrate deficiencies. A good example of this is Miners Creek where juvenile coho salmon have been seen in three different years residing in pools whose substrate is comprised entirely of pure decomposed granitic sand overlain with fine silt.

In the Shasta River, spawning coho salmon utilize gravel areas similar to those used by steelhead (Skinner 1959). These areas include the lower seven miles of the mainstem Shasta, Big Springs Creek, mainstem Shasta above Big Springs, Parks Creek (when flows are adequate), and the lower three miles of Yreka Creek (CDFG 1997). Juvenile coho salmon habitat is restricted in the Shasta River by high summer water temperature to approximately ten miles of the upper river, roughly delineated by the Siskiyou County Road A-12 crossing at river-mile 22 to one mile upstream of the confluence of Parks Creek at river-mile 32. Suitable water temperature is maintained in this reach by spring accretions that account for the majority of the flow in this system during the summer months. No water is released from Dwinnell Dam except for deliveries of irrigation water immediately downstream of the impoundment (CDFG 1997). This reach of the river is characterized by a meandering stream course, abundant aquatic vegetation, and intermittently dense riparian vegetation that provides the requisite cover elements for coho salmon and other juvenile salmonids. Summer water temperature limits salmonid rearing in the remainder of the river when Shasta Valley air temperature exceeds 100 ^{0} F and riparian vegetation is sparse or absent. Outmigrating juvenile coho salmon have recently been captured in downstream trapping efforts in the Shasta River (Chesney 2002).

Discussion and Conclusions

Information on the historical occurrence of coho salmon in the upper Klamath River is sparse. However, lack of information is not evidence that coho salmon were historically absent because this could be due to insufficient efforts to observe or document them, or to misidentification. Lack of historical information on coho salmon in the Klamath River can be attributed, in part, to the lack of proper species identification (Snyder 1931).

Credible scientific information sources describe the native North American range of coho salmon as extending from Alaskan coastal waters to the central California coast (Evermann and Clark 1931; Shapovalov and Taft 1954; Fry 1973; Moyle 1976; Sandercock 1991), and this description is widely accepted by fishery biologists and ichthyologists. Snyder (1931) states that coho salmon in the Klamath River “occur in large numbers”. Although these sources do not specifically state that coho salmon are native to the upper Klamath River and tributaries, it is important to note that none of these references specifically exclude these streams from the described range of coho salmon.

The fact that the upper Klamath River and tributaries are: 1) contiguous with documented historical coho salmon distribution in the lower reaches of the Klamath River system and historical coho salmon streams both north and south of the Klamath River; 2) contain no natural barriers that would prevent their migration into the upper reaches and tributaries such as the Scott and Shasta rivers; 3) have physical attributes that would have produced suitable coho salmon habitat in the past (e.g. gradient, morphology, and, in some cases like the Shasta River, spring sources that provide perennial flow); and 4) still contain suitable coho salmon habitat, provides substantial evidence that coho salmon likely inhabited the upper Klamath River and tributaries prior to hatchery stocking. It is evident from the coho salmon's persistent presence, and field observations made by the Department and other biologists, that sufficient habitat still exists in the Shasta and Scott rivers to support sustainable populations of coho salmon.

Although it cannot be determined with absolute certainty that the 1895 stocking did not result in a portion of the runs observed 15 years later in the Klamath River, this initial stocking was likely too small and in the wrong area to have had much chance of establishing a new, self-reproducing population in the upper Klamath River and tributaries. At least some portion of the eggs reared and released in the Trinity system in 1895 originated from Redwood Creek; a much smaller system. Redwood Creek coho salmon are specifically adapted to swimming relatively short distances (<60 miles) to reach their customary spawning areas. It seems unlikely these fish could have strayed the additional 150 river-miles necessary to reach the upper Klamath River to successfully establish a new run. Further, the eggs hatched and reared at Fort Gaston had opportunity to imprint to the Trinity River, and this also would have reduced the chances of straying to the upper portions of the Klamath. Finally, as reported by the Klamath River Basin Fishery Task Force (1991), Withler (1982) found that no introduction of Pacific anadromous salmonids using non-native broodstock has been successful in producing new, self-reproducing populations anywhere on the West Coast.

The great majority of coho salmon returning to spawn are three-year-old fish (although a small portion of each brood year returns as two-year-old fish, these primarily consist of precocious males). Therefore, run size in any given year is strongly influenced by the number of fish produced three years prior. Hatchery records indicate both coho salmon fry and yearlings were planted in 1895. It is not clear from the records if the fry and yearlings originated from the same brood year or were from two separate brood years. Regardless, because of their three-year life cycle, coho salmon returns from the 1895 plant would have appeared at the Klamathon Racks in only one or two of every three consecutive years. Egg take records from the Klamathon Racks show that this is not the case: coho salmon eggs were taken in substantial numbers in consecutive years beginning with the 1912-1913 season (Appendix Table D-1). This would not have been possible if all the adult fish had been descendants of fry and yearling plants made in 1895.

Substantial coho salmon populations appear to have been present in the upper Klamath River in 1910 as evidenced by the egg collections made at the Klamathon racks during the initial year of operation. The relatively large number of females required to produce the number of eggs collected that year and in subsequent years suggests that native coho salmon were well established in the Klamath River upstream of Iron Gate Dam's location. For the reasons described above, it is unlikely that these runs could have originated from the plants made in the Trinity River in 1895. Coho salmon were well documented in the Shasta and Scott rivers long before the construction of Iron Gate and Trinity River hatcheries and the subsequent introductions of large numbers of non-native coho salmon at the hatcheries. Based on the above discussions, the Department believes that coho salmon are native to the upper Klamath River system, including the Scott and Shasta Rivers, and historically occurred in these streams prior to any hatchery stocking.

LITERATURE CITED

Brownell, N. F., W. M. Kier, and M. L. Reber. 1999. Historical and current presence and absence of coho salmon, *Oncorhynchus kisutch*, in the northern California portion of the Southern Oregon-Northern California evolutionary significant unit. Prepared for the U.S. Department of Commerce, NOAA National Marine Fisheries Service, Southwest Fisheries Science Center, Service Order 40-ABNF-7-01479.

Bryant, H. C. 1923. Salmon fishcultural operations on the Klamath River. California Fish and Game. Sacramento, California. Volume 9, Number 1.

California Department of Fish and Game (CDFG). 1994. Petition to the Board of Forestry to list coho salmon (*Oncorhynchus kisutch*) as a sensitive species. Redding, Ca. 109p.

California Department of Fish and Game (CDFG). 1997. A Biological Needs Assessment for Anadromous Fish in the Shasta River Siskiyou County, California. Northern California-North Coast Region. Redding, CA. 29p.

California Department of Water Resources (CDWR). 1965. Bulletin No.136, North Coastal Area Investigation, Appendix C Fish and Wildlife. Prepared by California Department of Fish and Game Water Projects Branch, Sacramento CA.

California Farm Bureau Federation 2001. Letter from J. Hewitt to J. Pisciotto, plus supporting documentation, regarding submission of information for the CDFG coho status review, dated 8/31/2001.

California Fish and Game Commission (CFGC). 1913. Twenty-second Biennial Report for the years 1910-1912. Sacramento CA.

California Fish and Game Commission (CFGC). 1918. Twenty-fifth Biennial Report for the years 1912-1914. Sacramento CA.

California Fish and Game Commission (CFGC). 1921. Twenty-sixth Biennial for the years 1914-1916. Sacramento CA.

California Fish and Game Commission (CFGC). 1932. Thirty-second Biennial Report for the years 1930-1932. Sacramento CA.

Chesney, B. 2002. Shasta and Scott River Juvenile Salmonid Outmigrant Study. California Department of Fish and Game Steelhead Research and Monitoring Program, Annual Report 2001, Study 2a1. Draft-unpublished. Yreka, CA.

Cobb, J. N. 1931. Pacific Salmon Fisheries. Appendix XIII. Report of the United States Commissioner of Fisheries for the Fiscal Year 1930. U.S. Department of Commerce, Bureau of Fisheries. U.S. Government Printing Office, Washington.

Evermann, A.M. and Clark, H. W. 1931. A distributional list of the species of freshwater fishes known to occur in California. Calif. Div. of Fish and Game. Fish Bull. No. 35. 67 pp.

Fortune, J. D., A. R. Gerlach and C. J. Hanel. 1966. A study to determine the feasibility of establishing salmon and steelhead in the upper Klamath Basin. Oregon State Game Commission and Pacific Power and Light. 129 p.

Fry, D.H. 1973. Anadromous fishes of California. Calif. Dept. of Fish and Game. 112 pp.

Greenhorn Action Grange. 2001. Letter from R. Butler to M. Chrisman, plus supporting documentation, regarding submission of information for the CDFG coho status review. no date.

Hassler, T.J., C.M. Sullivan, and G.R. Stern. 1991. Distribution of coho salmon in California. Annual Report to California Department of Fish and Game, Contract No. FG7292.

Interactive Citizens United 2001. Letter from R. Gierak to R. Hight, plus supporting documentation regarding submission of information for the CDFG coho status review, no date.

Klamath River Basin Fisheries Task Force. 1991. Long Range Plan for the Klamath Basin Conservation Area Fishery Restoration Program. U.S. Fish and Wildlife Service (Yreka, CA) and William M. Kier Associates.

Leitritz, E. 1970. A history of California fish hatcheries 1870-1960. California Department of Fish and Game. Fish Bulletin 150. Inland Fisheries Branch, Sacramento, California.

Moyle, P.B. 1976. Inland fishes of California. Univ. of Calif. Press. Berkeley. 415 pp.

Sandercock, F.K. 1991. Life history of coho salmon. *In*: Pacific salmon life histories, C. Croot and L. Margolis, (eds). UBC Press, Vancouver. 564 pp.

Shapovalov, L. and A. C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri*) and silver salmon *(Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. Calif. Dept. Fish and Game, Fish Bull. No. 98. 373 pp.

Siskiyou County Farm Bureau 2001a. Letter from M. Armstrong to J. Pisciotto plus supporting documentation regarding submission of information for the CDFG coho status review, dated 9/19/2001.

Siskiyou County Farm Bureau 2001b. Letter from M. Armstrong to the CDFG, plus supporting documentation, regarding submission of information for the CDFG coho status review, dated 11/26/2001.

Skinner, J.E. 1959. Preliminary report of the fish and wildlife in relation to plans for water development in Shasta Valley. California Department of Water Resources; Shasta Valley Investigations, Bulletin No. 87.

Snyder, J.O. 1931. Salmon of the Klamath River, California. Division of Fish and Game, Bulletin No. 34.

U.S. Commission on Fish and Fisheries. 1895. Report of the Commissioner of Fisheries, 1895.

U.S. Fish Commission. 1911. Report of the Commission of Fisheries for Fiscal Year 1911.

U.S. Fish Commission. 1913. Report of the Commission of Fisheries for Fiscal Year 1913.

Withler, F. C. 1982. Transplanting Pacific salmon. Canadian Tech Report of Fisheries and Aquatic Sciences 1079. 27p.

Notes

Mark Hampton, Associate Fishery Biologist, California Department of Fish and Game, personal conversation, February 2002.